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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/566,135

01/27/2006

Gordon Calundann

3799.1014-000

1711

21005

7590

10/30/2009

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

530 VIRGINIA ROAD

P.O. BOX 9133

CONCORD, MA 01742-9133

EXAMINER

HU, HENRY S

ART UNIT

PAPER NUMBER

1796

MAIL DATE

DELIVERY MODE

10/30/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/566,135	Applicant(s) CALUNDANN ET AL.	
	Examiner HENRY S. HU	Art Unit 1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Election of July 27, 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 22-27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-27 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8-31-2009</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is in response to **two** things including: (A) **Election** and **one IDS** (7 pages) filed on July 27, 2009 and August 31, 2009, which is response to Restriction requirement filed on March 25, 2009. **Applicant's Election of Group I, Claims 1-21 is traversed with remarks on pages 2-3.** The traversal is on the ground(s) that no lack of unity objection is raised for PCT application. It would thereby not place an undue burden to search and examine the non-elected Group II (Claims 22-23) and Group III (Claims 24-27) with the elected Group I. This is not found persuasive.

For instance, Group I is drawn to **a proton-conducting polymer membrane** as well as it is related to product by process claim, Group II is drawn to **an electrode**, while Group III is drawn to **a membrane-electrode unit** and its **fuel cell**. Although the subject matter from each group may comprise the same or at least similar polyazoles and/or polymer membranes, its structure, function and application are indeed different. Particularly Group III requires using **at least one electrode** and **at least one membrane**. Attention is directed to the fact that both said membrane and the coating on said electrode are based on polyazoles, which are obtained by a seven-step process as specified in Group I. Additionally, Claim 24 can use any electrode as long as such an electrode is compatible with the membrane coating based on polyazoles, while polyazole type polymers prepared by process other than the process as disclosed in Group I may be also applied. Groups I, II and III are thereby not functionally equivalent and interchangeable.

2. **The structural elements are mutually exclusive and the search terms are also mutually exclusive**, thus they indeed create an undue burden on the Examiner. The requirement is still deemed proper and is therefore made FINAL. This Application is a **371/PCT/EP04/08229**. Applicants' **one Pre-Amendment** and **two IDS**' (8 pages total) are filed so far. With such a pre-amendment, Claims 24-26 are amended; new Claim 27 is added, while no claim is cancelled. To be specific, **Claim 25** is amended in **two** ways including: (A) to eliminate improper multiple claim dependency, and (B) to incorporate the process of making the membrane from parent Claim 1. **Claims 24 and 26** are amended accordingly. **Claims 1-27 are pending now** with **two** independent claims (Claim 1 and Claim 22), while non-elected three groups including Group II (Claims 22-23) and Group III (Claims 24-27) are withdrawn from consideration by the examiner. An action follows.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 9-10, 15, 17-18 and 20-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

On **Claim 1 at line 1 and at (G)-line 1**, two words of “**obtainable**” as well as on **Claims 1, 9-10, 15, 17-18 and 20-21**, several words of “**preferably**” render the claim **indefinite** because it is **unclear** whether the limitation(s) following the phrase are part of the claimed invention. The words such as “**obtainable**” and “**preferably**” is each a relative terminology. According to MPEP, it is not clear which range controls the actual metes and bounds of the claimed subject matter or whether it is indeed obtained.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. The limitation of parent **Claim 1** in present invention relates to **a proton-conducting polymer membrane based on polyazoles**, obtainable by a process comprising **seven** steps as:

(A) ***mixing*** one or more ***aromatic tetraamino compounds*** having a high phosphoric acid affinity or low phosphoric acid affinity ***with*** one or more ***aromatic carboxylic acids or esters*** thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, ***or mixing*** one or more ***aromatic and/or heteroaromatic diaminocarboxylic acids*** having a high phosphoric acid affinity ***in polyphosphoric acid to form a solution and/or dispersion***,

(B) ***heating*** the mixture from step (A), preferably under inert gas, ***and polymerizing until an intrinsic viscosity of up to 1.5 dug***, preferably from 0.3 to 1.0 dug, in particular from 0.5 to 0.8 dug, is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step (D),

(C) ***mixing*** one or more ***aromatic tetraamino compounds*** having a high phosphoric acid affinity or low phosphoric acid affinity ***with*** one or more ***aromatic carboxylic acids or esters*** thereof which contain at least two acid groups per carboxylic acid monomer which have a high

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*phosphoric acid affinity or low phosphoric acid affinity, **in polyphosphoric acid to form a solution and/or dispersion,***

*(D) **heating** the mixture from step (C), preferably under inert gas, **and polymerizing until an intrinsic viscosity of up to 1.5 dl/g**, preferably from 0.3 to 1.0 dl/g, in particular from 0.5 to 0.8 dl/g, is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step (B),*

*(E) **combining the polymer from step (B) and the polymer from step (D)**, the phosphoric acid affinity of the polymer from step (B) being **greater than** the phosphoric acid affinity of the polymer from step (D),*

*(F) **applying a layer** using the mixture according to step (E) on a carrier or on an electrode,*

*(G) **heating** the sheetlike structure/layer obtainable according to step (F), preferably under inert gas, until an intrinsic viscosity of more than 1.5 dl/g, preferably of more than 1.8 dl/g, in particular of more than 1.9 dl/g, is attained **to form a polyazole block polymer,***

*(H) **treating the membrane** formed in step (G) (until it is self-supporting).*

*See other limitations of dependent **Claims 2-21.***

7. **Claims 1-21 are rejected** under 35 U.S.C. **102(b)** as being anticipated by **or**, in the alternative, under 35 U.S.C. **103(a)** as obvious over **Guth et al. (WO 02/36249 A1).**

Present **Claims 1-21** are drawn to a proton-conducting membrane (based on polyazoles) which is described in **product-by-process** format. **According to MPEP:** It is well settled that where product by process claims are rejected over a prior art product that appears to be the same, the burden is shifted to the Applicant to establish an unobviousness difference, even if the production processes are different. *In re Marosi*, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Furthermore, the patentability of a product claim rests on the product formed, not on the method by which it was produced. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

The product according to parent **Claim 1** is an acid-doped proton-conducting polymer membrane, which is made by a process comprising **seven steps (A)-(H)**. The key point is that **two different polyazoles (made from A/B and C/D) are separately prepared in polyphosphoric acid and then combined.** The phosphoric acid affinity of the polymer from step **(B) is intentionally prepared so as to be greater than the phosphoric acid affinity of the polymer from step (D).** Open language “comprising” is applied to the process used in parent Claim 1.

8. **Guth et al.** has already prepared **some solid polymer membranes “doped with acid”** and is in the form as single or multi-layered plastic membrane to be useful for fuel cell application (see title; abstract, line 1-24. Such acid-doped membranes comprises at least one layer A of a polymer mixture consisting of “two or more” polymer components as: (A) **at least one polyazole having azole unit formula (1A) and/or (1B)**, and (B) a polysulfone comprising

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comprising sulfone units of (2A)-(2G) and no sulfonic acid. **At least in some cases, Guth has indeed used a mixture of two different polyazoles as starting material for (A)** so as to prepare acid-doped membrane.

9. Therefore, Guth is “only” silent about **“such a mixture of two different polyazoles (made from A/B and C/D) are separately prepared and then combined”**. In light of the fact that the prior art and the present invention recite **exactly the same mixture of two different polyazoles is used as well as the acid-doped membrane is particularly used for fuel cell application**, a reasonable basis exists to believe that the final acid-doped membrane products of the invention inherently possess the same properties and functions. Since PTO does not have proper means to conduct experiments, the burden of proof is now shifted to Applicants to show otherwise. *In re Best*, 195 USPQ 430 (CCPA 1977).

It has been held that where applicant claims a composition in terms of function, property or characteristic where said function is not explicitly shown by the reference and where the examiner has explained why the function, property or characteristic is considered inherent in the prior art, it is appropriate for the examiner to make a rejection under both the applicable section of 35 USC 102 and 35 USC 103 such that the burden is placed upon the applicant to provide clear evidence that the respective compositions do in fact differ. *In re Best*, 195 USPQ 430, 433 (CCPA 1977); *In re Fitzgerald et al.*, 205 USPQ 594, 596 (CCPA 1980).

10. **Claims 2-15** relate to the various chemical structures of precursors for making polyazole polymer, Guth’s disclosure in formula (1A) and (2A) along with the references cited therein would disclose or at least suggest such limitations.

Claims 16-19 relate to the treatment by moisture and/or heating so as to form a membrane, Guth's disclosure in making membrane along with the references cited therein would disclose or at least suggest such limitations.

Claims 20-21 relate to the thickness of membrane, Guth's disclosure in making membrane along with the references cited therein would disclose or at least suggest such limitations.

11. **Claims 1-21 are rejected** under 35 U.S.C. 103(a) as being unpatentable over **Sakaguchi et al.** (US 7,288,603 B2) in view of **Narang et al.** (WO 01/94450 A2) or **Guth et al.** (WO 02/36249 A1).

Present **Claims 1-21** are drawn to a proton-conducting membrane (based on polyazoles) which is described in product-by-process format. According to MPEP: It is well settled that where product by process claims are rejected over a prior art product that appears to be the same, the burden is shifted to the Applicant to establish an unobviousness difference, even if the production processes are different. *In re Marosi*, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Furthermore, the patentability of a product claim rests on the product formed, not on the method by which it was produced. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

The product according to parent **Claim 1** is an acid-doped proton-conducting polymer membrane, which is made by a process comprising **seven steps (A)-(H)**. The key point is that **two different polyazoles (made from A/B and C/D) are separately prepared in polyphosphoric acid and then combined**. The phosphoric acid affinity of the polymer from step **(B)** is intentionally prepared so as to be greater than the phosphoric acid affinity of the polymer from step **(D)**. Open language “comprising” is applied to the process used in parent Claim 1.

12. **Sakaguchi et al.** has already disclosed that **in the course of making acid-doped proton-conducting polymer membrane, polyazole type polymer can be readily prepared by directly heating from the claimed precursor mixtures** including: (A) amine compound and (B) carboxylic acid compound, which both precursor compounds are as disclosed or suggested in **instant dependent Claims 2-15**. See title; abstract; column 4, line 33 – column 12, line 45.

13. Therefore, Sakaguchi is “only” silent about “**using a mixture of two different polyazoles (made from A/B and C/D) are separately prepared and then combined**”. **Two** references including **Narang and Guth** in combination or alone can teach such a subject matter. **Narang** teaches that in making acid-doped or acid-containing polymer membranes for using in fuel cell, binary polymer blend optionally including a third polymer may be used. See abstract; page 1. By doing so, high proton conductivity, high temperature stability and/or low methanol permeability may be obtained (page 2, line 5-6).

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14. **Guth** has prepared **some solid polymer membranes “doped with acid”** and is in the form as single or multi-layered plastic membrane to be useful for fuel cell application (see title; abstract, line 1-24. Such acid-doped membranes comprises at least one layer A of a polymer mixture consisting of “two or more” polymer components as: (A) **at least one polyazole having azole unit formula (1A) and/or (1B)**, and (B) **a polysulfone** comprising comprising sulfone units of (2A)-(2G) and no sulfonic acid. **At least in some cases, Guth has indeed used a mixture of two different polyazoles as starting material for (A)** so as to prepare acid-doped membrane. By doing so, such obtained polymer membranes is useful for fuel cell application.

15. In light of the fact that all involving references are dealing with the making of proton-conducting membrane for fuel cell application and the proton exchange, proton conductivity and high temperature stability is thereby the current key issue. Therefore, one having ordinary skill in the art would have found it obvious to modify Sakaguchi's process of making an acid-doped proton-conducting membrane by **using a mixture of two different polyazoles that are separately prepared and then combined** as taught by a combination of two references including Narang and Guth. Therefore, better and more efficient acid-doped proton-conducting polymer membranes may be obtained since such proton conductor membranes may be thermally stable over a wide range and at the same time also can maintain high conductivities.

16. **Claims 2-15** relate to the various chemical structures of precursors for making polyazole polymer, references' disclosure along with the references cited therein would disclose or at least suggest such limitations.

Claims 16-19 relate to the treatment by moisture and/or heating so as to form a membrane, references' disclosure in making membrane along with the references cited therein would disclose or at least suggest such limitations.

Claims 20-21 relate to the thickness of membrane, references' disclosure in making membrane along with the references cited therein would disclose or at least suggest such limitations.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicants' disclosure. The following references relate to an acid-doped proton-conducting polymer membrane based on polyazoles, obtainable by a process comprising seven steps as specified: **US 2007/0292734 A1 to Kiefer et al.** has disclosed a process for producing a proton conducting electrolyte membrane for fuel cell application. It is achieved by **irradiating a polymer film and then "graft"-polymerized a vinylphosphonic acid monomer.** See abstract, line 1-5; Claim 1 at page 16. Its earliest priority date is **May 10, 2002**. However, Kiefer does not disclose or suggest using a mixture of two different polyazoles. Therefore, Kiefer cannot teach or suggest the membrane limitation of parent Claim 1.

18. Any inquiry concerning this communication or earlier communication from the examiner should be directed to **Dr. Henry S. Hu** whose telephone number is **(571) 272-1103**. The

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examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Vasu Jagannathan, can be reached on (571) 272-1119. The **fax** number for the organization where this application or proceeding is assigned is **(571) 273-8300** for all regular communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Peter D. Mulcahy/
Primary Examiner, Art Unit 1796

/Henry S. Hu/
Examiner, Art Unit 1796

October 19, 2009